

• Alan Turing, aged 16. This photograph was taken in 1928 by Chaffins of Sherborne.

THE SHERBORNE FORMULA

the making of

Alan Turing

RACHEL HASSALL - SCHOOL ARCHIVIST

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"The art of constructing cryptographs or ciphers – intelligible to those who know the key and unintelligible to others – has been studied for centuries. Their usefulness on certain occasions, especially in time of war, is obvious, while it may be a matter of great importance to those from whom the key is concealed to discover it. But the romance connected with the subject, the not uncommon desire to discover a secret, and the implied challenge to the ingenuity of all from whom the key is hidden, have attracted to the subject the attention of many to whom its utility is a matter of indifference."

W.W. Rouse Ball,
Mathematical Recreations and Essays.

So read a sixteen year old Sherborne School boy in a book he borrowed in November 1928 from the school library.

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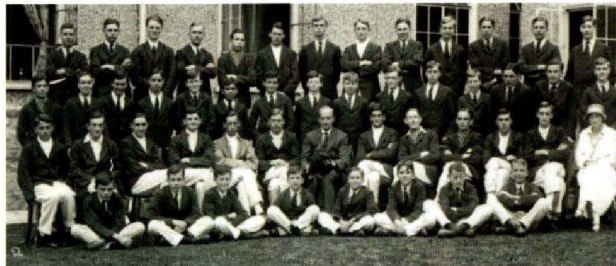
This boy's early interest in cryptographs and ciphers with their 'challenge to the ingenuity' would result in him, just eleven years later, cracking the German Enigma code. The boy's name was Alan Mathison Turing.

Alan Turing (1912-1954) attended Sherborne School from 1926 to 1931 and, with 2012 marking the centenary of his birth, we look at how those formative years shaped the man who is today recognised as one of Britain's greatest mathematicians and the father of the modern computer.

John Turing described his brother as 'an eccentric of outsize proportions' and even at the age of thirteen Alan's behaviour was attracting attention with a mention in the local newspaper of his arrival by bicycle in Sherborne in May 1926. At this time Alan's parents were living in France and with Alan due to begin his first term at Sherborne School on 4 May 1926 he set off alone the preceding day, taking the Channel ferry

from St Malo and arriving in Southampton only to discover that owing to the General Strike no trains were running. Undeterred, Alan sent his housemaster a telegram informing him that he would not now be arriving until the following day and set out to cycle the 63 miles from Southampton to Sherborne across what was for him unknown territory. He stopped overnight at the Crown Hotel in Blandford Forum where, Alan reported later in a letter to his parents, 'the people at Blandford were very amused', and the following morning the hotel staff turned out to see him off on the remainder of his journey to Sherborne.

Alan's elder brother hated life so much at his own school, Marlborough College, that he advised his parents not to send Alan to school there. Alan's parents had a connection with Sherborne School through a family friend who knew one of the physics masters and so they hoped that with Alan's already proven interest in science Sherborne might suit him. At



• Alan Turing, aged 13, Westcott House, 1926. Alan is seated on the far left-hand side of the front row. Just a month before this photograph was taken Alan Turing had cycled the 63 miles from Southampton to Sherborne.

[Transcribed by Eric from Southampton to Sherborne
Sherborne - the first arrival in Sherborne
May 5th 1926 Wednesday
[No. 17] Westcott House
Sherborne
Dorset

Dear Mother & Daddy

On ship found that all railway services were cancelled except for night service. I heard someone say in ward that they would have to go to London in an empty milk can good crossing & sleep. Since the sailing but no one knew about faster on from there here. Would not take my bag so could not supplement one with other part so I could do programme left bag with baggage master, started out off docks about 10 o'clock got map for 2/- including Southampton & vicinity of Sherborne by about 3 miles, started where I Sherborne was just outside. With an awful drive, bus General Post Office part where I started found cycle shop had things done & left at 10 o'clock had lunch 7 miles out & I went on to Blandford 3 miles got apple & an exception Barrow peddle but wrong by it I've 6d went on Ringwood 4 miles

• Alan Turing's letter to his parents describing his cycle ride from Southampton to Sherborne in May 1926. (Original in King's College Archives, Cambridge.)

The railway service improved gradually until there were this week two or three trains a day up and down advertised to run. On the first day or two of the stoppage the scholars of the King's School and the Sherborne School for Girls were due to return. Many of them had returned before the railway services were disorganised, but many others only arrived at Sherborne after great inconvenience, and in some cases unforgettable experiences. In one case a boy from France, who was coming to Sherborne School, could not get any further than Southampton, but he cycled from there through what was to him unknown country, and arrived safely at Sherborne.

• Extract from *The Western Gazette*, 14 May 1926, reporting Alan Turing's cycle ride from Southampton to Sherborne.

this time, however, the emphasis at Sherborne was, as with most public schools, on learning the Classics and excelling on the games field. As a result the curriculum gave little emphasis to the teaching of science and this was reflected in the poor provision of teaching space, as reported in a Board of Education inspection carried out in October 1930:

"There is no lecture room. Lectures are given in one or other of the four laboratories: and a laboratory is ill adapted for lecture purposes even if it is fitted with a demonstration bench. There is no room equipped and set apart for advanced work in physics. A room designated the biological laboratory is put to other uses and is not suitably equipped for biological work. The accommodation is below standard for a school of this type and the work suffers in consequence."

The physics master at this time was Henry Shorland Gervis. Gervis, who had an MA from Corpus Christi College Cambridge, had joined the School staff in 1921 and remained for the next 43 years. Despite the poor working conditions, Gervis was evidently an inspiring and inventive teacher who found in Alan a keen and able student,

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SHELL (I).
MR. G. B. SLEIGH.
(24)

a Goodden, M. C.	4	A	ε	c
b Barry m., A. M.	2	W	H	c
c Nash, R. E.	1	A	B	b2
d Law, H. R.	1	A	H	b1
e Maclure, G. R.	2	W	H	a
a Scott m., H. W. F.	2	W	H	b1
b Gregory, J. D.	3b	A	B	d
a Cooper m., K.	3b	A	B	c
d Auret, L. C. A.	3a	W	H	b2
e Gomez, F. S.	3a	W	H	b2
a Alexander, D. H. D.	2	W	H	b2
b Hannay, E. J. H.	3b	W	ε	b1
d Knight m., E.	2	W	H	b2
e Hanrott, C. C.	1	W	H	a
a Smyly, R. P. P.	5	W	H	d
g Marks, H. J.	1	W	ε	b1
g Eglington m., R. C.	1	A	B	e
a Burmester, R.	3b	A	B	b1
c Maundrell, H. B. H.	3b	A	B	c
c Stote m., G. A. K.	1	A	B	c
c Cameron, P. W. G.	1	A	B	d
d Warner m., J. P. H.	3b	A	B	a
c Johnston, V. D.	4	A	B	c
h Turing, A. M.	2	A	ε	a

Mathematics: 1, Mr. Randolph; 2, Mr. Jarrett; 3a, Mr. Elbertson; 3b, Mr. Innes; 4, Mr. Rees and Mr. Davis; 5, Mr. Hodgson.
Science: a, Mr. Andrews; W, Mr. Hornsby-Wright.
Greek: • Mr. Mallett.
Latin: H, Mr. Innes; B, Mr. Bessly.
French: a, Mr. Wordsworth; b1, Mr. Fox; 3a, Mr. Parry-Jones; c, Mr. Wright; d, Mr. Kittermaster; e, Mr. Sleigh.
Dancing: Mr. Davies.

- Blue Book, Summer Term, 1926. Alan Turing's first term at Sherborne.



- Henry Gervis, Alan Turing's physics master at Sherborne.

but one whose ideas and methods needed refining and tempering. In one of Alan's early school reports for Michaelmas term 1927 Gervis wrote 'He shows considerable promise, but he must learn to express himself adequately'. Alan's methods of expressing himself were still causing Gervis problems in the Summer term of 1929 when he wrote 'He has done some good work but generally sets it down badly. He must remember that Cambridge will want sound knowledge rather than vague ideas'. However, improvements in Alan's work did finally appear and by Michaelmas term 1930 Gervis could report that 'He has done some excellent work, mostly strict training for his scholarship examinations. I can only hope Cambridge will think as well of him as I do', and in Alan's final school report of Summer term 1931 Gervis wrote with a sense of pride and satisfaction, 'He has done well: I wish him success at Cambridge.'

It was probably Gervis who instigated Alan's invitation back to Sherborne School on 9 March 1953 to give a paper on 'The Electronic Brain' to the Alchemists (a society for those interested in the progress of science). Unfortunately, no transcript of Alan's paper survives but the event was reported in the School magazine and, despite the initial reservations of his young audience as to whether they would understand the subject matter, Alan had obviously lost none of the skills he had learnt at Sherborne in putting across his ideas:

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"The Society met for the first time this term on Monday, March 9th [1953], at the Green when a paper on the Electronic Brain was read by Mr Turing. Several members of the audience had foreseen the possibility that they might not understand a word of what was said, but they could not have been more mistaken. Mr Turing made a very clear analogy between a stupid clerk, with his mechanical calculating device paper to write his workings on and his instructions, and the Electronic Brain which combined all these in one. All that was necessary was to put the instructions into a tape machine and the mass of wires, valves, resistors, condensers and chokes did the rest, the answer appearing on another tape. The Brain was, however, liable to make mistakes and subtle checking devices were included to detect them. As yet it cannot do anything of its own accord, nor is it able to rectify its own mistakes. Slides were shown of the general layout of the machine and also of some previous ones made in the last century. The questions at the end of the meeting showed how much the Society had grasped the principles underlying the workings of the Electronic Brain."

The Shirburnian, Lent 1953

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Mathematics was the other area where Alan was to excel. According to the Board of Education's inspection of October 1930 the School's Mathematics department was then flourishing under the direction of Dr Edwin Davis:

"The School is fortunate in possessing a Mathematical staff whose academic qualifications and teaching capacity are well above the average. The same Master is in charge of the subject as at all the two previous Inspections. He is a highly qualified and capable teacher of considerable experience, and he has organised his department most efficiently."

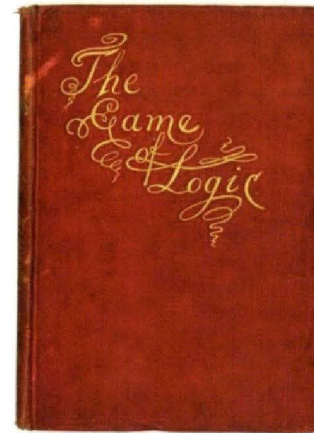
Known to everyone as Ben, Davis was then the only member of the School staff to hold a Ph.D. He joined the staff of Sherborne School in 1903 and died in 1933 aged just 53. In his obituary a fellow master described Davis as having 'a wonderful power of letting light into the understanding and unremitting energy and patience in doing so'. Davis was also a tutor at Westcott House, where Alan boarded, and would therefore have come into daily contact with him. Davis also accompanied boys from the house when their housemaster, Geoffrey O'Hanlon, took them on holidays to Sark and Cornwall. Alan went on several of these holidays and O'Hanlon's holiday snaps reveal a relaxed and happy Turing seated comfortably beside a smiling Ben Davis. The care and affection that Davis had for



• A holiday snap taken in Sark in 1932. This happy group includes Alan Turing and his former housemaster, Geoffrey O'Hanlon (in hat).



• Rock in Cornwall, April 1930. A smiling Alan Turing is seen sitting next to Ben Davis, the head of mathematics at Sherborne.



• Lewis Carroll's *The Game of Logic*. Alan Turing borrowed this book from the School library in November 1930.



• Christopher Morcom in the Upper Fifth, 1926.

the boys is demonstrated in a letter written by Alan to his parents shortly after the death in 1930 of his school friend, Christopher Morcom, from bovine tuberculosis. In it Alan writes that prior to Morcom's death 'Ben very kindly sent me a note on Thursday saying he had heard there was bad news and to be prepared for the worst.'

Another member of the mathematics department who played an important part in Alan's development while at Sherborne was Donald Birkby Eperson. Eperson held an MA from Christ Church, Oxford and taught at Sherborne School from 1927 to 1938. He was a great advocate of the value of 'Recreational Mathematics' in the classroom, believing

that it allowed boys to investigate problems and puzzles on their own and so he introduced them to the literary works of Lewis Carroll with their many arithmetical and logical allusions. Undoubtedly inspired by Eperson, Alan borrowed three books by Lewis Carroll from the School library in November 1930: *The Game of Logic*, *Alice in Wonderland* and *Through the Looking Glass*. This love of puzzles and ciphers fostered at Sherborne would eventually lead Alan in 1939 to the Government Code and Cypher School at Bletchley Park. Alan was always keen to share his enthusiasm for mathematics and puzzles with others, particularly the young. At Sherborne he became the 'Mathematician-in-ordinary' who would help boys with their homework, and in his penultimate term at Sherborne his housemaster wrote in his school report that 'He takes a fatherly interest in his

IN ORDER to perpetuate the memory of

in the school he loved and to give an incentive to the development of Natural Science of which he was such a brilliant student, a fund has been invested the income from which shall provide for a Prize which may take the form of books or apparatus and which shall be presented on "Speech Day". The Science teachers shall award the Prize in accordance with the following schedule:

1. An annual Prize to be awarded from the income of a trust fund.
2. The Prize to be awarded for Natural Science and given on "Speech Day".
3. The Prize to be called "The Christopher Morcom Prize."

- The Christopher Morcom prize book awarded to Alan Turing in 1930 and 1931.

Dress.
All coats and waistcoats must be black, or plain dark grey or dark blue.
Pull-overs, if worn, must be plain and inconspicuous.
Grey flannel suits, not lighter than the regulation colour, are allowed on week-days.
Black ties only are allowed with ordinary clothes.

Prefects.
School Prefects enjoy the following privileges:—
Leave out for an hour after Lock-up, but in no case after 7.15 p.m.
Right of entrance to other Houses than their own :
Right to carry walking sticks :
in addition to the general privileges of the Sixth Form.

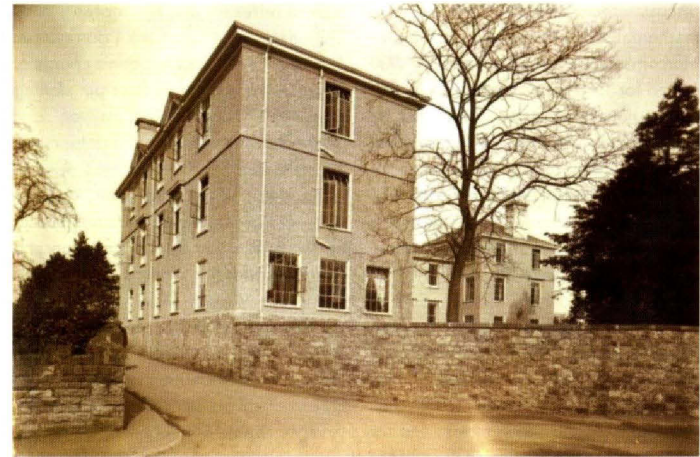
Sixth Form Privileges.
Special Hat Ribbon.
Right to take books out of the School Library.
Right to dispense with passes.
Privileged Bathing.
Use of Headmaster's Drive and Sixth Form Door.
Bicycling to the Field on School Match days.
N.B. (1) House Prefects are entitled to all Sixth Form privileges.
(2) Upper Fifth are entitled to the Library privilege.

- Sherborne School rules, April 1929. The Sixth Form Privileges included the right to borrow books from the School library, of which Alan Turing made full use.

dormitory, and no doubt imparts his learning and curiosity to them.' Nor could Alan resist the temptation in 1953 of explaining to a friend's six year old daughter how to solve her solitaire puzzle.

Eperson recalled teaching Turing in the Sixth form:

"In one sense he was difficult to teach, as he preferred his own independent methods, and was less interested in learning 'book-work' and developing a good style of written work. On the other hand he was an industrious member of the class, who needed no stimulus to exert himself mentally, and could readily appreciate the solution that I showed him to any problem that he could not solve 'by the light of nature', i.e. by discovering alternative methods of his own devising that are sometimes 'clumsy and cumbersome' and sometimes brilliant but unsound. All that I can claim is that my deliberate policy of leaving him largely to his own devices and standing by to assist when necessary, allowed his natural mathematical genius to progress uninhibited."



- Westcott House in Horsecastles where Alan Turing boarded during his time at Sherborne. Alan's study was the third window on the right on the ground floor.

Alan's 'independent methods' of learning lead him to the school library from where as a sixth former he was allowed to borrow books. In 1930, the school library held between 8,000 to 10,000 volumes and the Board of Education report stated that it played 'an important part in the intellectual life of the School'. The library loans registers reveal that between October 1928 and May 1931 Alan borrowed 33 titles. However, he was evidently not a great reader of fiction with only three of these titles coming from that category, these being Lewis Carroll's *Alice in Wonderland* and *Through the Looking Glass*, and A.J. Evans's *The Escaping Club*. The remainder of the titles were for the subjects of mathematics, chemistry, physics and astronomy, some of which Alan borrowed on several occasions, including Thomas

Preston's *The Theory Heat* which he borrowed five times between February 1930 and June 1931. Other titles, such as J.H. Jean's *The Universe Around Us* and T.W. Webb's *Celestial Objects for Common Telescopes* he took away in December 1929 for Christmas holiday reading.

The School library also played an important part in Alan's friendship with fellow schoolboy, Christopher Morcom, a friendship that would be instrumental in defining Alan's future life and career. Morcom was a member of a different house from Alan and as such they were not supposed to fraternise, however, Alan discovered that Morcom used the School library on Wednesday afternoons for private study and so it became a place where the two boys could meet to

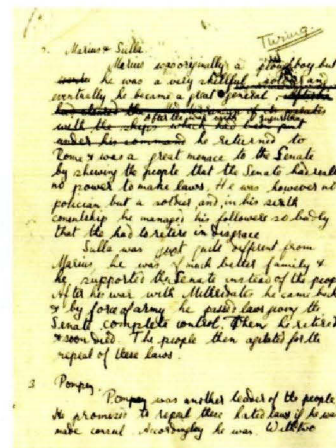
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discuss their shared interests in mathematics, science and astronomy. Morcom's sudden death in February 1930 ended for Turing a period of intellectual companionship and friendship that he had not known before. On the night of Morcom's death his housemaster spoke to the boys saying, 'We cannot tell why Chris Morcom should have suffered a death like this, but there is a reason. Maybe it was to save him from a life of pain or illness; maybe to help some of you in some way, for a friend like that can often by his death do more to influence others even than by his life.' This message was critical in helping Alan deal with his profound sense of loss and for him Morcom's death became the catalyst for all his future achievements. A few days later Alan wrote to his mother saying 'I feel sure that I shall meet Morcom again somewhere and that there will be some work for us to do together, as I believed there was for us to do here. Now that I am left to do it alone I must not let him down but put as much energy into it, if not as much interest, as if he were still here. If I succeed I shall be more fit to enjoy his company than I am now.'

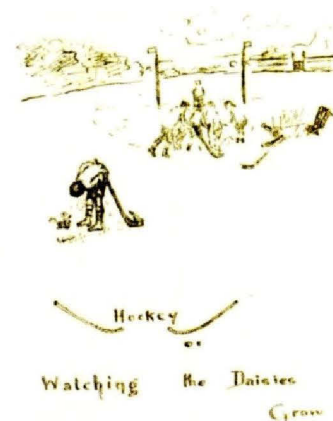
With this new sense of focus, Alan set about applying himself seriously to his school work and on securing an Open Scholarship at King's College, Cambridge, he was made a School prefect and won many School prizes, including in 1931 the School Mathematics Medal. His mother remembered asking Alan what he had been awarded all these

School prizes for and him replying in his self-effacing manner, 'Oh! I don't know: but I think when you've been a couple of years in the sixth they start pensioning you off.' There was, however, one particular prize that Alan was determined to win the first year that it was announced: the Christopher Morcom Prize for Science. Morcom's family had set up this prize in Christopher's memory and Alan succeeded in winning it in 1930 and 1931. The Morcom prize is still awarded by the School today, embodying the original hope that, as it had with Alan Turing, 'the competition shall accomplish its end of encouraging the true pursuit of Science among Shirburnians.'

Following Alan's death in June 1954 his mother wanted to ensure that her son's achievements were not forgotten and set about donating material to places with which he had been associated. It is for this reason that amongst the archives held at Sherborne School is a collection of unique material relating to the life of Alan Turing. This material includes Alan's school reports; the School Mathematics Medal awarded in 1931; the OBE awarded in 1945 for war service in the Foreign Office and at Bletchley Park; the official photograph taken when he was elected to a fellowship of the Royal Society in 1951; and copies of eighty-six letters written by Alan to his parents and others between 1924 and 1954.

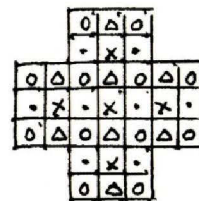


• An example of Alan Turing's history homework attached to his school report to demonstrate the untidiness of his work.



• Entitled 'Hockey or Watching the Daisies Grow' this caricature was drawn of Alan Turing by his mother in 1923 while he was attending Hazelhurst Preparatory School in Sussex.

I find it helps if I am trying to do the puzzle to use four kinds of pieces like this or better still a board with the squares in 4 colours . Each piece always stays on the same colour until it is taken . You start with only 4 X's and you must still have one at the end and so you must be very careful of them. But there are 12 O's, to be got rid of. One needs to remember this



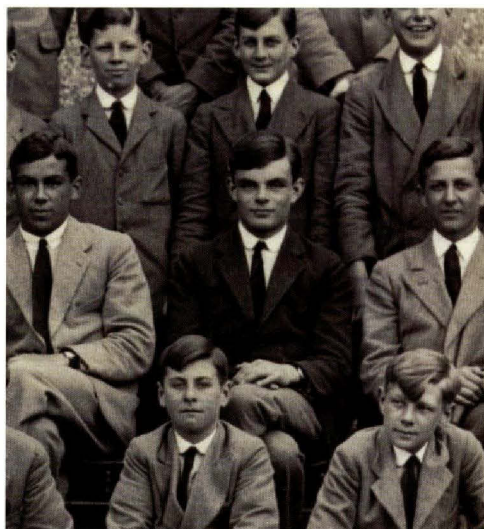
• Alan Turing's explanation to a friend's six year old daughter of how to solve her solitaire puzzle, May 1953. (Original in King's College Archives, Cambridge.)

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On 10 September 2009, Prime Minister Gordon Brown issued a posthumous apology to Alan Turing for the sentence he received following his conviction in 1952 for having a sexual relationship with a young man. The apology ended with the following paragraph:

"It is thanks to men and women who were totally committed to fighting fascism, people like Alan Turing, that the horrors of the Holocaust and of total war are part of Europe's history and not Europe's present. So on behalf of the British government, and all those who live freely thanks to Alan's work, I am very proud to say: we're sorry. You deserved so much better."



• Alan Turing, Westcott House, 1930.

Alan Turing OBE, PhD, FRS, is indeed an Old Shirburnian of whom we can be proud.

THE FRONT COVER OF THIS EDITION OF VIVAT! SHOWS SOME OF THE BOOKS BORROWED FROM SHERBORNE SCHOOL LIBRARY BY ALAN TURING DURING HIS SIXTH FORM YEARS. THE FULL LIST IS:

Title of book	Dates borrowed by Alan Turing
<i>Illusions</i>	20 February 1931
<i>Journal of the Chemical Society</i> , vols. 95, 96, 97	29 May 1930
<i>Lead</i>	30 September 1929
<i>Money</i>	2 February 1930
<i>Isotopes</i>	24 March 1929
<i>Mathematical Recreations and Essays</i>	7 November 1928
<i>Modern Electrical Theory</i>	18 January 1929
<i>Alice in Wonderland</i>	4 November 1930
<i>The Game of Logic</i>	4 November 1930
<i>Through the Looking Glass</i>	4 November 1930
<i>Matter and Motion</i>	13 February 1929 29 July 1929
<i>The Common Sense of the Exact Sciences</i>	28 October 1928
<i>Space, Time and Gravitation</i>	6 November 1929 18 December 1930 22 January 1930
<i>The Nature of the Physical World</i>	17 March 1929 24 March 1929 31 May 1930
<i>Sidelights on Relativity</i>	21 October 1929
<i>The Escaping Club</i>	31 January 1931
<i>Contributions to Mental Philosophy</i>	21 January 1931
<i>The New Physics Lectures for Laymen and Others</i>	27 January 1929
<i>Supply and Demand</i>	29 March 1930 6 May 1930
<i>The Stars in their Courses</i>	24 April 1931
<i>The Universe Around Us</i>	16 December 1929
<i>Atoms and Rays: An Introduction to Modern Views on Atomic Structure and Radiation</i>	16 March 1929
<i>Phases of Modern Science</i>	24 February 1929 24 March 1929
<i>The Theory of Heat</i>	12 February 1930 6 May 1930 30 November 1930 24 January 1931 16 May 1931
<i>A Selection of Photographs of Stars, Star-Clusters and Nebulae</i>	19 October 1930
<i>Modern Chromatics: with Applications to Art and Industry</i>	12 May 1929
<i>A Short History of Mathematics</i>	10 October 1928
<i>Celestial Objects for Common Telescopes</i>	16 December 1929
<i>The Recent Development of Physical Science</i>	13 February 1929
<i>Science and the Modern World (Lowell Lectures 1925)</i>	24 February 1929
<i>Sound Waves and their Uses</i>	13 February 1931